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# S E R I E S 9 3




# A Reliable Tool For All Basic Temperature Control Applications

The SERIES 93 is a microprocessor-based controller with single input and dual output. It has a feature set that includes heat/cool auto tune, ramp to set point, versatile alarms and percent power limit. Optional hardware features include red or green displays, universal low and high voltage power supply, CE compliance and a NEMA 4X rating.

Watlow's SERIES 93 is a 1/16 DIN temperature controller tested to meet NEMA 4X (IP65) standards for water and corrosion resistance (optional). This is ideal for applications such as food processing, packaging, medical instruments and where equipment needs to be cleaned frequently. The front panel can be hosed or wiped down without damage to the controller.

The compact size of the controller allows more flexibility in applications where space is a problem, such as bench top equipment.

The SERIES 93 also has many of the standard Watlow features, such as dual digital display, accuracy at ±0.1 percent of span, a wide operating environment from 0 to 65°C (32 to 149°F) at 115V~(ac) line voltage power, easy setup with operator friendly prompts.

The SERIES 93 is manufactured by ISO 9001 and reliably backed by a three-year warranty.

**Your Authorized Watlow Distributor is:**

## Features and Benefits

**Dual display**
- Displays set point and actual

**Dual outputs**
- Provides heat/cool capacity

**NEMA 4X (IP65) certified (BSEN)**
- Offers water and dust resistance

**Universal inputs**
- Offers a wide range of sensor inputs

**Ramp to set point**
- Controls temperature rise

**Percentage power limiting**
- Avoids stressing components

**Lock-out facility**
- Offers high security

**±0.1 percent accuracy**
- Offers excellent range accuracy

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WIN-93-0207

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# Specifications

**Control Mode**
- Microprocessor-based, user-selectable control modes
- Single input, dual output
- 2.5Hz input sampling rate
- 1Hz display update rate
- Ramp to set point: 0 to 9999 degrees or units per hour
- Heat and cool auto tune

**Agency Approvals**
- UL® 508, C-UL®, CE, NEMA 4X File #E102269

**Operator Interface**
- Sealed membrane front panel
- Dual, 4-digit red or green displays
- Advance, Increment, Decrement and Infinity keys
- User-selectable screen display

**Accuracy**
- Calibration accuracy and sensor conformity: ±0.1 percent of span, ±1°C @ 25°C ± 3°C (77°F ± 5°F) ambient and rated line voltage
- Accuracy span: 540°C (1000°F) minimum
- Temperature stability: ±0.1°C/°C (±0.2°F/°F) rise in ambient maximum
- Voltage stability: ±0.01 percent of span per percent of rated line voltage

**Sensors/Inputs**
- Thermocouple, grounded or ungrounded sensors
- RTD 2- or 3-wire, platinum, 100Ω @ 0°C (32°F) calibration to DIN curve (0.00385Ω/Ω/°C); user selectable
- Process, 4-20mA⎓(dc) @ 5Ω, or 0-5V⎓(dc) @ 10kΩ input impedance
- Sensor break protection de-energizes controller output to protect system or selectable bumpless transfer to manual operation
- °F or °C or process units display, user selectable

**Input Range**

Specified temperature ranges represent the controller's operational span

**• Thermocouple**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Type J | 0 | to | 750°C | or | 32 | to | 1382°F |
| Type K | -200 | to | 1250°C | or | -328 | to | 2282°F |
| Type N | 0 | to | 1250°C | or | 32 | to | 2282°F |
| Type S | 0 | to | 1450°C | or | 32 | to | 2642°F |
| Type T | -200 | to | 350°C | or | -328 | to | 662°F |

**• RTD Resolution (DIN)**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1° | -200 | to | 700°C | or | -328 | to | 1292°F |
| 0.1° | -128.8 | to | 537.7°C | or | -199.9 | to | 999.9°F |

**• Process**

4-20mA⎓(dc) @ 5Ω, or -999 to 9999 units
0-5V⎓(dc) @ 10kΩ, or -999 to 9999 units

**Output 1 (Direct or reverse acting for control)**
- Electromechanical relay
- Switched dc
- 4-20mA
- Solid-state relay

**Output 2 (Direct or reverse acting control or alarm)**
- Electromechanical relay
- Switched dc
- Solid-state relay

**Output Specifications**
- Electromechanical relay, Form C, 5A @ 120/240V~(ac) or 30V⎓(dc) maximum, rated resistive load, without contact suppression
- Switched dc signal provides a non-isolated minimum turn on voltage of 3V⎓(dc) into a minimum 500Ω load, maximum on voltage not greater than 12V⎓(dc) into an infinite load
- 4-20mA⎓(dc) non-isolated 0-800Ω load
- Solid-state relay④, Form A, 0.5A @ 24V~(ac) min. to 265V~(ac) max. Opto-isolated, without contact suppression. Off state output impedance is 31MΩ

**Output Configurations**

Output 1 Selections:
- On-off: P, PI, PD, PID, heat or cool action
- Adjustable switching differential: 1 to 55°C (1 to 99°F)
- Proportional band: 0 to 555°C (1 to 999°F) or 0.0 to 999.9 percent of span
  Integral: 0 (off) or 0.1 to 99.9 minutes per repeat
  Reset: 0 (off) or 0.01 to 9.99 repeats per minute
  Rate/derivative: 0 (off) or 0.01 to 9.99 minutes
  Cycle time: 0.1 to 999.9 seconds

**Output 2 Selections:**
- Control with action opposite that of Output 1 (reverse or direct)
- Process or deviation alarm with flashing alarm message
- Process or deviation alarm without alarm message
- Alarm with separate high and low set points
- Hysteresis: 1 to 9999° or units switching differential

**Line Voltage/Power**
- 100-240V~(ac) (85-264V~(ac)); 50/60Hz ±5 percent
- 12-24V≂(ac/dc) (10-26≂(ac/dc); 50/60Hz ±5 percent
- Power consumption 5VA maximum
- Data retention upon power failure via non-volatile memory

**Operating Environment①**
- 0 to 65°C (32 to 149°F) at 115V~(ac) line voltage power
- 0 to 60°C (32 to 140°F) at 230V~(ac) line voltage power
- 0 to 90 percent RH, non-condensing
- Storage temperature: -40° to 70°C (-40° to 185°F)

**Terminals**
- Size 6 universal head screw terminals accepts 20-14 gauge wire

**Dimensions**

| | | |
|---|---|---|
| Height | 53 mm | (2.1 in.) |
| Width | 53 mm | (2.1 in.) |
| Overall Depth | 119 mm | (4.7 in.) |
| Behind panel depth | 104 mm | (4.1 in.) |
| Weight | 0.2 kg | (0.5 lbs) |

# Ordering Information

**9 3 - 1 - 0 0**

**SERIES 93**
Microprocessor-based
1/16 DIN, single input, dual output
4-digit displays

**Nema 4X (IP65)② Option**
A = Without NEMA 4X (IP65) Rating
B = With NEMA 4X (IP65) Rating

**CE Option**
A = Non CE Compliant
B = CE Compliant

**Output 1**
C = Switched dc output, non-isolated
D = Electromechanical relay, Form C, 5A, without contact suppression③④
F = Process, 4-20mA⎓(dc), non-isolated
K = Solid state relay, Form A, 0.5A, without contact suppression④

**Output 2**
A = None
C = Switched dc output, non-isolated
D = Electromechanical relay, Form C, 5A, without contact suppression③④
K = Solid state relay, Form A, 0.5A, without contact suppression④

**Line Voltage/Power**
0 = 100-240V~(ac) (high voltage)
1 = 12-24V≂(ac/dc) (low voltage)

**Display**

Upper/Lower

| | |
|---|---|
| RR = Red/Red | AA = Red/Red (without Watlow logo) |
| RG = Red/Green | AB = Red/Green (without Watlow logo) |
| GR = Green/Red | AC = Green/Green (without Watlow logo) |
| GG = Green/Green | AD = Green/Red (without Watlow logo) |

① Operating environment is 0 to 60°C (32 to 140°F) for live voltage exceeding 240V

② To effect NEMA 4X (IP65) rating requires a minimum mounting panel thickness of 1.5 mm (0.06 in.) and surface finish not rougher than 0.000812 mm (0.000032 in.)

③ Electromechanical relays are not recommended for PID control. They are warranted only for 100,000 contact closures

④ Switching inductive loads (relay coils, etc.) requires using an RC suppressor

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